ENERGY CONSUMPTION ANALYSIS AND RECOMMENDATIONS

Objective of the Project:
The project is aimed at creating a detailed report that highlights key insights into energy consumption patterns. This involves analysing energy trends, identifying top-consuming devices, understanding the relationship between consumption and trading hours, and providing actionable recommendations for saving energy.

Data overview:
The data is about energy consumption from various devices across a site, and it includes the following key details:

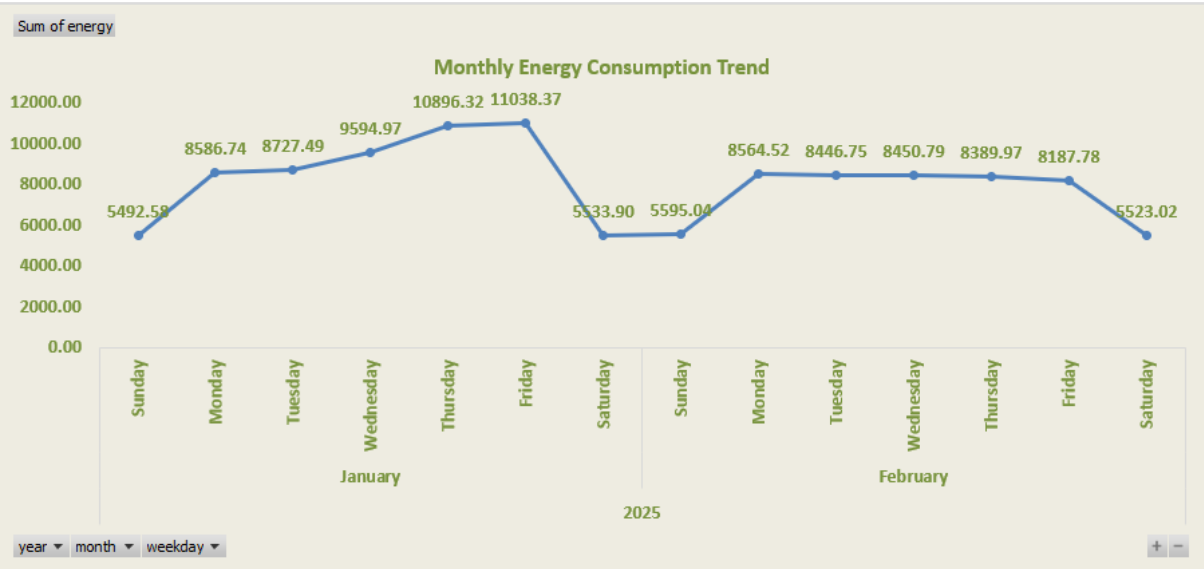
1. **Timestamp Data**: Each row has a timestamp indicating when the energy was recorded, showing data on a daily and weekly basis.
2. **Device Data**: The devices listed in the data include things like **servers, risers, condensers**, and others. These devices consume varying amounts of energy.
3. **Energy Metrics**: The important metrics we have are things like **energy, power, current, voltage, power factor, and temperature** — all of which relate to how much energy is being used.
4. **Categorization**: The data also differentiates between different types of activities like **trading**, **non-trading**, **prep**, etc. This helps us see how energy consumption changes based on the type of activity happening at the time.

1. **Course of Acton:**
   Energy Trends:
   - Analysed how energy consumption varied over time, focusing on monthly and weekly trends.
   - Graphs were created to present the total energy consumption for January and February, along with weekly trends. The analysis highlighted that January had a significantly higher total energy consumption compared to February, with Sunday and Thursday showing higher energy consumption patterns.
2. **Top Energy-Consuming Devices**:
   - Identified the devices that consumed the most energy across the site.
   - Bar charts were used to show the energy consumption by device, revealing that "Main 1" and "DB6/SFR 2nd Floor Riser" were the top energy-consuming devices, followed by the other devices like "DB3/FFSR Server Room 1st Floor" and "DB5/FFR 1st Floor Riser."
3. **Consumption vs. Trading Hours**:
   - Analysed the relationship between energy consumption and trading hours (categorized as close, non-trading, prep, and trading).

- Visualizations, including bar graphs and line charts, were used to show how energy consumption varied between trading and non-trading hours. The data revealed that energy consumption was highest during non-trading hours, with a significant drop during trading hours, suggesting potential optimization opportunities.

MONTHLY & WEEKLY TRENDS:
The chart below presents energy consumption trends over two months—January and February—along with a breakdown by week.

- **Monthly Overview**:
  - As seen in the chart, **January** recorded the highest energy consumption at **₹59,870.37**, which accounts for the majority of the overall consumption during the two months.
  - **February**, on the other hand, saw a drop in energy consumption, with a total of **₹53,157.86**. This indicates a reduction in energy usage as compared to January.
- **Weekly Breakdown**:
  - For **January**, the weekly energy consumption varied, with **Wednesday** and **Thursday** registering the highest consumption (₹9,594.97 and ₹10,896.32, respectively). These peaks might be attributed to the workload or activities occurring mid-week.
  - In **February**, energy consumption patterns followed a similar trend, though slightly lower overall. **Wednesday** and **Thursday** again had higher energy consumption, showing consistency in peak days.
  - **Saturdays** consistently recorded the lowest consumption across both months, with **₹5,533.90** in January and **₹5,523.02** in February, indicating reduced operations or energy usage during weekends.



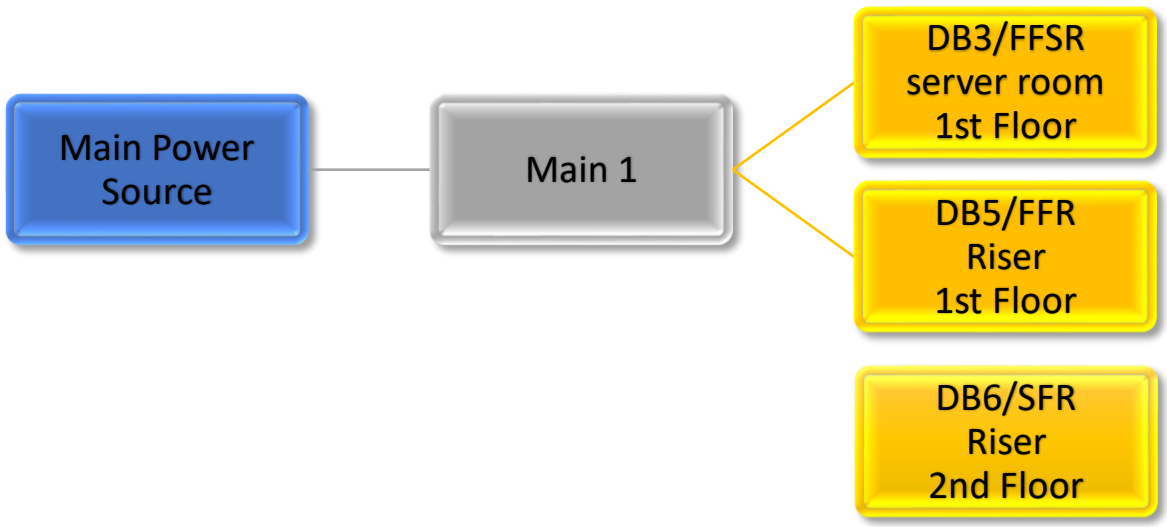
Insights:

- **January vs. February**:
  January had higher energy consumption compared to February, potentially due to the start of the year, where more systems may have been operational, or due to external factors affecting consumption. It's worth investigating if the decrease in February aligns with changes in operational activities or if it's due to more optimized usage patterns.
- **Weekly Consumption Trends**:
  Wednesday and **Thursday** consistently showed higher energy consumption in both months, which could indicate peak operation days or heavy workloads on these days. This insight could help optimize energy consumption by analyzing if operations on these days can be better managed or if shifts in operations can reduce peak energy usage.
- **Low Consumption on Saturdays**:
  Saturdays consistently showed the lowest energy consumption, suggesting that the workload might be lighter, or fewer devices are in operation. This could be used as a benchmark for energy-saving strategies or to allocate resources more efficiently on other days.

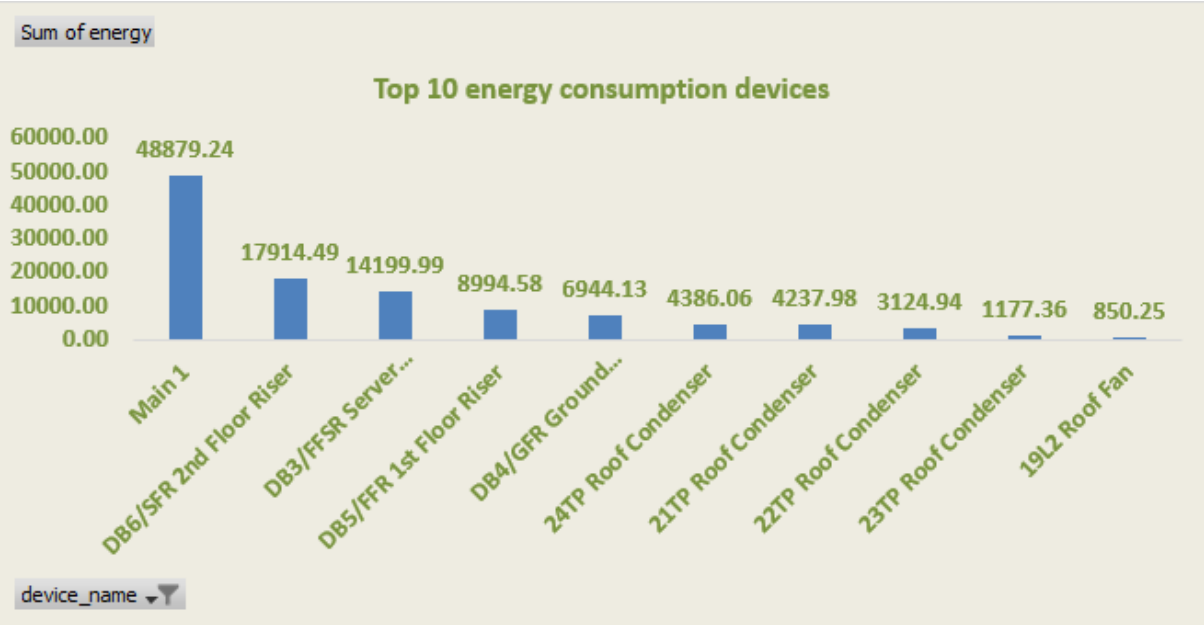
TOP ENERGY-CONSUMING DEVICES:

I identified the devices that consumed the most energy based on the data provided.

A **bar chart** was created to rank the devices by their total energy consumption. From the chart, we can observe that the device **"Main 1"** accounted for the highest energy consumption, contributing to a significant portion of the total energy usage. Other devices, such as **"DB6/SFR 2nd Floor Riser"** and **"DB3/FFSR Server Room 1st Floor"**, followed closely in terms of energy consumption.



This helped highlight the proportion of energy usage across the different devices at the site.

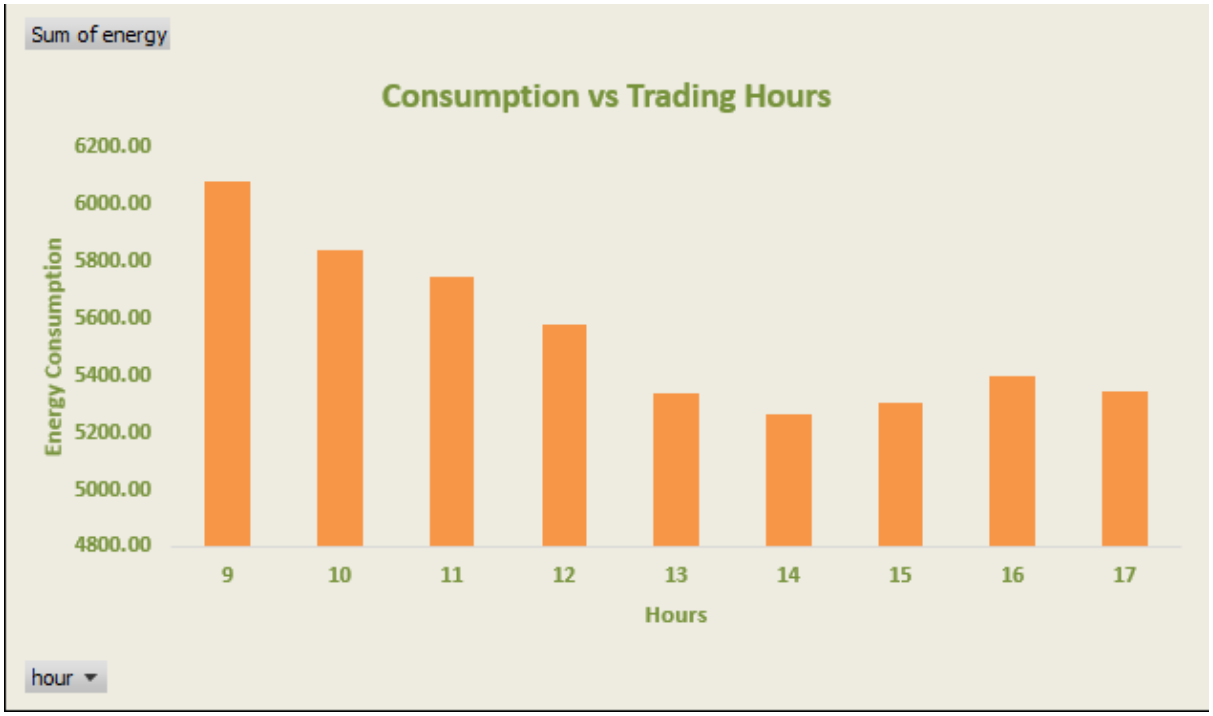


Insights:

- **Main 1** is the top energy-consuming device, which could indicate it plays a major role in the site's operations.
- Devices such as **DB6/SFR 2nd Floor Riser** and **DB3/FFSR Server Room** also have relatively high consumption, suggesting they might be critical to the functioning of the site as well.

Consumption vs. Trading Hours:

I analysed the energy consumption in relation to **trading hours** by grouping the data accordingly. I used a **bar chart** to represent the energy consumption during each hour of the day, with a focus on trading periods.



Insights:

- The data reveals that energy consumption during **trading hours** is consistently higher. For example, in the hours between **9 AM to 5 PM**, there is a clear increase in energy usage, with consumption peaking during certain hours (e.g., **9 AM**, **10 AM**, etc.).
- The total energy consumed during **trading hours** amounts to **₹49,896.67**, which makes up a significant portion of the overall energy consumption, indicating that the site's operations during these hours are energy-intensive.
- The data shows relatively stable energy consumption across other hours outside of the trading period, suggesting that the equipment is used less actively outside of these times.

Conclusion:

This analysis highlights that the **trading hours** contribute significantly to energy usage. To improve energy efficiency, it may be beneficial to optimize the use of devices during these high-consumption hours, such as by reducing energy consumption during peak trading times or adjusting the equipment usage.

Overall Conclusion:

Through this project, key patterns in energy consumption were identified across different time periods, device categories, and operational phases like trading and non-trading hours. January showed higher overall energy usage compared to February, with mid-week days like Wednesday and Thursday consistently consuming more energy. Devices like “Main 1” and “DB6/SFR 2nd Floor Riser” were major contributors to total energy consumption, showing where energy-saving efforts can be focused.

The analysis also made it clear that energy usage peaks during trading hours, which presents an opportunity for better scheduling or optimization of equipment. These findings provide a strong base

for making data-driven decisions to reduce unnecessary energy usage and improve operational efficiency.

Overall, the project successfully turned raw energy data into practical insights and recommendations that can help in cutting costs and making energy usage more efficient at the site.

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